

obtaining the right location of the drilled hole from the end of the shaft *A*.

After the hole was drilled, the locating pin *F* was pulled out and the plate *D* swung around from the first position, as shown by the dotted lines, to the second position, and pin *F* was inserted in another hole. Each hole for pin *F* was located so as to bring the bushing plate *D* into the proper positions for drilling and counterboring. A special counterbore or mill was then used through the bushing *G* to elongate the hole to the proper size and depth. This counterbore was made from drill rod of the same diameter as the width of the elongated slot in the shaft. Four teeth were cut in the end and it was then hardened and tempered.

After the shaft *A* was properly drilled and counterbored, it was removed from the vise, and the bushing plate *D* swung back into the drilling position; this also brings the stop-pin *H* into position for locating the next shaft. Another shaft is now put into the vise against the stop-pin and the previous operations are repeated.

This device has been used with new bushing plates to suit many different kinds of work. For drilling and tapping, when using a reversible tapping chuck or a drill press that has a reversible spindle, it will be found to be a very handy tool. After the tap hole is drilled in the work, pin *F* is pulled out and bushing plate *D* can be swung out of the way.

Jig for Drilling Deep Holes in Studs. — The jig to be described was designed for drilling 50,000 brass studs which were turned from a  $\frac{1}{2}$ -inch square bar, with a short section of the original square bar left at the center of the finished stud. The drilling operation could not be done conveniently on the automatic screw machine, as it was necessary to drill a  $\frac{1}{4}$ -inch hole to a depth of 2 $\frac{1}{2}$  inches.

The machine used is a  $\frac{1}{2}$ -speed lathe which is provided with both wheel and lever feed for the tailstock. For this work, the tailstock spindle was removed and replaced by a special spindle which is shown at *A* in the cross-sectional view, Fig. 17. In the illustration it will be seen that the spindle is provided